

University of Groningen

**The effect of an e-learning supported Train-the-Trainer program on implementation of suicide guidelines in mental health care.**

de Beurs, Derek P; de Keijser, Jos; de Groot, Marieke; Mokkenstorm, Jan; van Duijn, Erik; de Winter, Remco F; Kerkhof, Ad JFM

*Published in:*  
Journal of Affective Disorders

*DOI:*  
[10.1016/j.jad.2015.01.046](https://doi.org/10.1016/j.jad.2015.01.046)

**IMPORTANT NOTE: You are advised to consult the publisher's version (publisher's PDF) if you wish to cite from it. Please check the document version below.**

*Document Version*  
Publisher's PDF, also known as Version of record

*Publication date:*  
2015

[Link to publication in University of Groningen/UMCG research database](#)

*Citation for published version (APA):*

de Beurs, D. P., de Keijser, J., de Groot, M., Mokkenstorm, J., van Duijn, E., de Winter, R. F., & Kerkhof, A. JFM. (2015). The effect of an e-learning supported Train-the-Trainer program on implementation of suicide guidelines in mental health care. *Journal of Affective Disorders*, 175, 446-453.  
<https://doi.org/10.1016/j.jad.2015.01.046>

**Copyright**

Other than for strictly personal use, it is not permitted to download or to forward/distribute the text or part of it without the consent of the author(s) and/or copyright holder(s), unless the work is under an open content license (like Creative Commons).

The publication may also be distributed here under the terms of Article 25fa of the Dutch Copyright Act, indicated by the "Taverne" license. More information can be found on the University of Groningen website: <https://www.rug.nl/library/open-access/self-archiving-pure/taverne-amendment>.

**Take-down policy**

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

Downloaded from the University of Groningen/UMCG research database (Pure): <http://www.rug.nl/research/portal>. For technical reasons the number of authors shown on this cover page is limited to 10 maximum.



## Research report

## The effect of an e-learning supported Train-the-Trainer programme on implementation of suicide guidelines in mental health care



Derek P. de Beurs<sup>a,b,\*</sup>, Marieke H. de Groot<sup>a,b</sup>, Jos de Keijser<sup>c</sup>, Jan Mokkenstorm<sup>d</sup>, Erik van Duijn<sup>e</sup>, Remco F.P. de Winter<sup>f</sup>, Ad J.F.M. Kerkhof<sup>a,b</sup>

<sup>a</sup> Department of Clinical Psychology, VU University, Amsterdam, The Netherlands

<sup>b</sup> EMGO Institute for Health and Care Research, Amsterdam, The Netherlands

<sup>c</sup> Groningen University, Groningen, The Netherlands

<sup>d</sup> GGZ Foundation for Mental Health Care GGZ inGeest, The Netherlands

<sup>e</sup> GGZ Foundation for Mental Health Care Delfland, The Netherlands

<sup>f</sup> GGZ Foundation for Mental Health Care, Parnassia, The Hague, The Netherlands

## ARTICLE INFO

## Article history:

Received 15 September 2014

Received in revised form

16 January 2015

Accepted 16 January 2015

Available online 24 January 2015

## Keywords:

Suicide

Implementation

Guideline

e-Learning

Train-the-Trainer

## ABSTRACT

**Background:** Randomized studies examining the effect of training of mental health professionals in suicide prevention guidelines are scarce. We assessed whether professionals benefited from an e-learning supported Train-the-Trainer programme aimed at the application of the Dutch multidisciplinary suicide prevention guideline.

**Methods:** 45 psychiatric departments from all over the Netherlands were clustered in pairs and randomized. In the experimental condition, all of the staff of psychiatric departments was trained by peers with an e-learning supported Train-the-Trainer programme. Guideline adherence of individual professionals was measured by means of the response to on-line video fragments. Multilevel analyses were used to establish whether variation between conditions was due to differences between individual professionals or departments.

**Results:** Multilevel analysis showed that the intervention resulted in an improvement of individual professionals. At the 3 month follow-up, professionals who received the intervention showed greater guideline adherence, improved self-perceived knowledge and improved confidence as providers of care than professionals who were only exposed to traditional guideline dissemination. Subgroup analyses showed that improved guideline adherence was found among nurses but not among psychiatrists and psychologists. No significant effect of the intervention on team performance was found.

**Limitations:** The ICT environment in departments was often technically inadequate when displaying the video clips clip of the survey. This may have caused considerable drop-out and possibly introduced selection bias, as professionals who were strongly affiliated to the theme of the study might have been more likely to finish the study.

**Conclusions:** Our results support the idea that an e-learning supported Train-the-Trainer programme is an effective strategy for implementing clinical guidelines and improving care for suicidal patients.

**Trial registration:** Netherlands Trial Register (NTR3092 [www.trialregister.nl](http://www.trialregister.nl)).

© 2015 The Authors. Published by Elsevier B.V. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

**Abbreviations:** CASE interview, Chronological Assessment of Suicidal Events; IAU, implementation as usual; MHI, Mental Health Institution; PGSB, multidisciplinary practice guideline for the assessment and treatment of suicidal behaviour; PITSTOP, Professionals In Training to STOP suicide; TtT-e, e-learning supported Train-the-Trainer programme; SIRI, Suicide-Intervention-Response-Inventory-version

\* Corresponding author. Tel.: +31 6 24504141.

E-mail addresses: [derekdebeurs@gmail.com](mailto:derekdebeurs@gmail.com) (D.P. de Beurs),

[mariekedegroot@ziggo.nl](mailto:mariekedegroot@ziggo.nl) (M.H. de Groot),

[jos.de.keijser@ggzfriesland.nl](mailto:jos.de.keijser@ggzfriesland.nl) (J. de Keijser),

[mokkenstorm@gmail.com](mailto:mokkenstorm@gmail.com) (J. Mokkenstorm),

[e.vanduijn@ggz-delfland.nl](mailto:e.vanduijn@ggz-delfland.nl) (E. van Duijn),

[r.dewinter@parnassia.nl](mailto:r.dewinter@parnassia.nl) (R.F.P. de Winter), [ajfm.kerkhof@vu.nl](mailto:ajfm.kerkhof@vu.nl) (A.J.F.M. Kerkhof).

<http://dx.doi.org/10.1016/j.jad.2015.01.046>

0165-0327/© 2015 The Authors. Published by Elsevier B.V. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

## 1. Introduction

Evidence-based guidelines improve the quality of patient care (Grol and Grimshaw, 1999, 2003). In mental health care, guidelines inform professionals of diagnosis and treatment of patients with a mental health disorder, particularly those with severe mental illness (Hutschemaekers, 2003; Wobrock et al., 2009). Over the last twenty years, a large number of psychiatric guidelines have been published (Weinmann et al., 2007). However, adherence to these guidelines has been unsatisfactory (Shafran et al., 2009; Weinmann et al., 2007). Structured implementation of guidelines may improve adherence (Grol and Grimshaw, 1999). Only a few studies specifically address

the implementation of psychiatric guidelines (Girlanda et al., 2013; Weinmann et al., 2007), and there is a need for more randomized controlled studies.

Although suicidal behaviour frequently occurs in Dutch Mental Health Institutions (Huisman et al., 2009) (MHI's), up until 2012 there were no national evidence-based guidelines on the assessment and treatment of suicidal behaviour. Local guidelines were available in a limited number of MHI's and even when available they still lacked important elements (Verwey et al., 2007).

It was argued that a national evidence-based guideline may result in better assessment and treatment of suicidal behaviour (Bool and Doeven, 2007). In May 2012, the multidisciplinary practice guideline for the assessment and treatment of suicidal behaviour (PGSB) (van Hemert et al., 2012) was issued. The PGSB-recommendations are based on international guidelines on the assessment and treatment of suicidal behaviour (Association, 2003; Australian, 2004; Group, 2003; Health, 2004) and on two empirical reviews of the Scottish government (Leitner et al., 2008; McLean et al., 2008). In the guideline, an integrated model of stress-diathesis (Goldney, 2008) and entrapment (Williams et al., 2005) is used to understand the onset and continuation of suicidal conditions. The integrated model depicts suicidal behaviour as the outcome of a process influenced by biological, psychological, environmental and situational factors (Wasserman et al., 2012); the interaction of which may lead to entrapment. It is proposed that entrapment is the specific condition in which suicidal behaviour arises. The guideline recommends systematic investigation of the suicidal condition with the Chronological Assessment of Suicidal Events (CASE)-interview (Shea, 1998a). This is followed by weighting of risk and protection factors for suicide in individual patients, and results in a structured diagnosis, a treatment strategy, and also a safety plan to ensure continuity of care and the involvement of significant others in the treatment of suicidality.

To implement the PGSB in Dutch mental health care we developed an e-learning supported Train-the-Trainer programme (TtT-e) to be delivered to all of the staff of psychiatric departments (de Beurs et al., 2013b). The Train-the-Trainer model is based on the Adult Learning Theory (Knowles, 1970) which states that the best learning resources are those that come from peers, and on the Diffusion of Innovation Theory (Rogers, 2010) stating that people adopt new information better through their trusted social networks. TtT-e combines a one day face-to-face training session with an additional e-learning module. This form of blended learning is used extensively in medical education and has been found to be more effective when compared with solely traditional instructor-based training (Means et al., 2013; Pearce et al., 2012).

Suicide prevention training has been shown to improve knowledge, skills, and attitudes towards suicidal behaviour of both gatekeepers (Capp et al., 2001; Chagnon et al., 2007; Gullestrup et al., 2011; Isaac et al., 2009; Joffe, 2008; King and Smith, 2000; Matthieu et al., 2008; Stuart et al., 2003; Wyman et al., 2008) and mental health professionals (Appleby et al., 2000; Oordt et al., 2009). Additionally, professional and gatekeeper training in the diagnosis and treatment of depressive disorders, which are associated with suicidal behaviour (Hawton and van Heeringen, 2009) has been shown to result in a reduction of suicide rates (Hegerl et al., 2010; Knox et al., 2003; Matthieu et al., 2008; Rutz et al., 1989; Szanto et al., 2007). However, except for one study (Wyman et al., 2008), the effects of suicide prevention training were investigated in non-randomized controlled study models.

In the current multicentre cluster randomized trial called PITSTOP suicide (Professionals In Training to STOP suicide (de Beurs et al., 2013b)), we examined the effect of TtT-e in addition to implementation as usual (IAU; that is, dissemination of the PGSB guideline via websites of professional institutions, reviews in clinical journals, presentations at conferences, books and manuals) versus only IAU. Departments were clustered in pairs on the basis

of patient characteristics to ensure comparability of experience with suicidal patients of professionals in both conditions.

We hypothesised that individual professionals who were trained via TtT-e would adhere more closely to the PGSB when compared with professionals who received only IAU. Since a multidisciplinary comparison (Palmieri et al., 2008) found that nurses are likely to have received less training in dealing with suicidal behaviour of patients than psychiatrists or psychologists, we hypothesised that nurses would benefit more from TtT-e when compared with psychiatrists and psychologists.

## 2. Methods

### 2.1. Design

Multicentre cluster randomized controlled trial. MHIs were invited to provide departments for participation during nationally supported meetings and conferences on suicide prevention in the Netherlands from January 2009 until December 2011. Departments were considered eligible for participation if they treated patients aged  $\geq 18$  years, if professionals considered there to be a need for training in suicide prevention skills, if the training was supported by the institutional board and if institutions were willing to accept costs due to loss of production. Eligible departments were matched in pairs based on primary patient diagnoses and average treatment duration (de Beurs et al., 2013b).

### 2.2. Randomisation

Members of matched pairs were randomly allocated to either IAU (control) or IAU+TtT-e (intervention). Binary randomisation was performed by an independent researcher of the Institute for Health and Care Research (EMGO+) who was not involved in the study. Blinding of professionals to the outcome was not possible. Outcomes of matching and randomisation are described elsewhere (de Beurs et al., 2013b).

### 2.3. Ethics statement

On-line informed consent was obtained for all individual participants after the procedures had been fully explained. The study (including digital informed consent) was approved by the Medical ethical commission of the VU Medical Centre (2011/151) on 17th May 2011. It was registered in the Netherlands Trial Register (NTR3092 www.trialregister.nl) on 4th October 2011. The authors confirm that all ongoing and related trials for this intervention have been registered.

### 2.4. Intervention

In the intervention condition, full multidisciplinary teams (all registered nurses, psychologists, and psychiatrists) were trained by peers in the application of the PGSB via TtT-e. In TtT-e, three types of professionals were involved: masters, trainers and trainees. Training was applied on two levels: first, trainers were trained by masters. Subsequently, trainees were trained by trainers. The training consisted of a one day, small group face-to-face training session and was supported by an additional e-learning module that lasted an hour.

The masters were experts in the field of suicide prevention due to work they had previously carried out on the scientific aspects and clinical practice. Trainers were mental health professionals from various disciplines (psychiatrists, psychologists or nurses), selected by their management because they were role models in a team, and their excellent training skills. Trainees were health professionals within the trainer's team.

The PGSB recommendations served as the starting point to determine the content of the TtT-e programme. The PGSB recommends systematic investigation of the suicidal condition of patients by using the Chronological Assessment of Suicidal Events (CASE) interview (Shea, 1998b). Risk and protection factors for suicide of individual patients were weighted based on its outcome. Subsequently, structured diagnosis, treatment strategy, and a safety protocol were determined. In the TtT-e programme, the CASE interview was the overall framework for each of four role plays in which one trainee acts as an actual suicidal patient from his/her daily practice and the other trainee interviews the 'patient' via the CASE interview. The intervention is described elsewhere in more detail (de Beurs et al., 2013b).

## 2.5. Measurements

All assessments were carried out via an on-line survey called Qualtrics. Participating departments were asked to send a list with the e-mail addresses of the psychiatrists, psychologists and nurses employed by them. Next, each participant was invited to take the on-line survey via an individual link. In the intervention condition, the baseline assessment (T0) was sent to all individual professionals of a psychiatric department two weeks before that department would follow the face-to-face training. In the control condition, T0 was carried out as soon as the team was informed of their status as the control condition. In both conditions, the follow-up assessment (T1) was carried out three months after the baseline assessment was sent. Participants in the intervention condition were obliged to complete T0, in order to gain access to the face-to-face training and to gain access to the e-learning module. Also, professional credits were awarded if participants had completed both T0, T1 and if they had followed the face-to-face training. To encourage professionals in the control condition to complete T0 and T1 they were given a coupon worth 10 Euro per completed assessment. Three reminders were sent per assessment and team managers were asked to motivate their staff to complete the assessments.

## 2.6. Professional recruitment and follow-up

Departments were recruited from January 2009 until December 2011. The first baseline assessments were sent to individual participants on 24th November 2011. The last 3 months follow-up assessments were received on 28th February 2013.

## 2.7. Outcome measures

All outcome measures pertained to the individual level and consent was sought per individual. The primary outcome was guideline adherence, a self-constructed on-line measure. Professionals were asked to respond to 30-s video clips ( $n=5$ ) in which experienced nurses, psychologists and psychiatrists interact with suicidal characters, played by actors. Professionals rated the likelihood of replying to the patient by using 25 different replies. Each reply could be rated on a Visual Analogue Scale, ranging from 1 to 100 (1=very unlikely, 100=very likely). For example: 'Ask whether the patient thinks about suicide', 'Ask how hopeless the patient is feeling'. The replies of professionals to patient behaviours in this measure reflect recommendations according to the PGSB. At T0 and T1, similar clips were displayed. All item scores were added together for each assessment and subsequently divided by the total number of items ( $n=125$ ), resulting in a mean score ranging from 0 to 100; a higher score represents greater guideline adherence. A reference score was set twice. First by a panel of masters ( $n=6$ ) who completed the video clips, resulting in a reference score of a mean of (SD) 75.0 (6.0). Second, by psychology students ( $n=351$ )

resulting in a score of a mean of (SD) 59.0 (8.0) and a Cronbach's alpha of 0.92. A preview in English can be found at [http://fppvu.eu.qualtrics.com/SE/?SID=SV\\_cw1bB0HVY2k0iqh](http://fppvu.eu.qualtrics.com/SE/?SID=SV_cw1bB0HVY2k0iqh).

The secondary outcome was measured by the 7-item subscale self-evaluation of knowledge about suicidal behaviour of the 14-item Question-Persuade-Refer-questionnaire (Tompkins and Witt, 2009). Another outcome, provider confidence, was calculated by adding together the scores of the items 'I am confident in my ability to successfully assess suicidal patients' and 'I am confident in my ability to successfully treat suicidal patients' (Oordt et al., 2009). Finally, 'recognition of an appropriate response to suicidal behaviour' was measured with the validated 24-item Dutch version (Scheerder and Van Audenhove, 2006) of the Suicide-Intervention-Response-Inventory-version 2 (VROS (Scheerder and Van Audenhove, 2006)/SIRI-2 (Neimeyer and MacInnes, 1981)). At T1, all professionals were asked if they had read the summary of the guideline. In the intervention condition, professionals were also asked whether they had used the e-learning module (YES/NO), and if so, for how many minutes and how they would rate the module (1 very bad–10 very good). To observe adherence to the training programme, training sessions were randomly visited by graduate psychology students. Adherence was scored on a 4-point Likert scale (1=very strong, 4=very low).

## 2.8. Sample size

For the primary outcome (guideline adherence) the sample size was calculated according to Twisk (2006). The number of professionals that needed to be included was set at 165. This number is sufficient to find a 10% change (Grol and Wensing, 2006), assuming 0.05 alpha and the statistical power of  $1-\beta=80\%$ . A correction of 20% for clustering of effects within departments was applied.

## 2.9. Deviations from study protocol

In our published protocol article (de Beurs et al., 2013b), we described how we had two follow-up assessments, one directly after the training, and one at the three month follow-up. Due to ICT difficulties in displaying the video clips of our self-constructed guideline adherence scale, which led to several complaints being made by participants, we decided to omit the assessment directly after the training, and to only offer this at the 3 months follow-up. This way we hoped to reduce drop-out at 3 months follow-up.

## 2.10. Statistical analyses

First, we conducted a missing values analysis to identify patterns in missing values between the conditions. We found professionals in the intervention condition who were lost to follow up to systematically score lower on guideline adherence at baseline compared to other professionals. Based on this analysis we concluded that missing values were not missing at random. Therefore, we decided not to impute missing values and to conduct an available case analysis.

We analysed the effect of the intervention on the primary and secondary outcomes by using multilevel models. Because multilevel modelling allows for the partition of the total variation in variation because of differences in measurements between professionals (level 1) and variation because of differences between departments (level 2), we could establish the impact of the observed changes on the different levels. The randomisation condition was the between-subject factor. The baseline score of the dependent variable was added as a covariate to adjust the outcome for baseline differences. The effect of the e-learning module above and beyond the face-to-face training was analysed by using a multilevel model with 'usage of the e-learning module' (YES/NO) as the between-subject factor and guideline adherence

as the outcome variable. Next, we separately analysed the effect of the intervention for nurses, and psychiatrists/psychologists by re-running all mixed model analyses with the total file split by profession. Differences between intervention and control condition were presented by a regression coefficient ( $B$ ) and 95% confidence intervals and  $p$ -value. Cohen's  $d$ 's represent the effect size of the TtT-e programme.

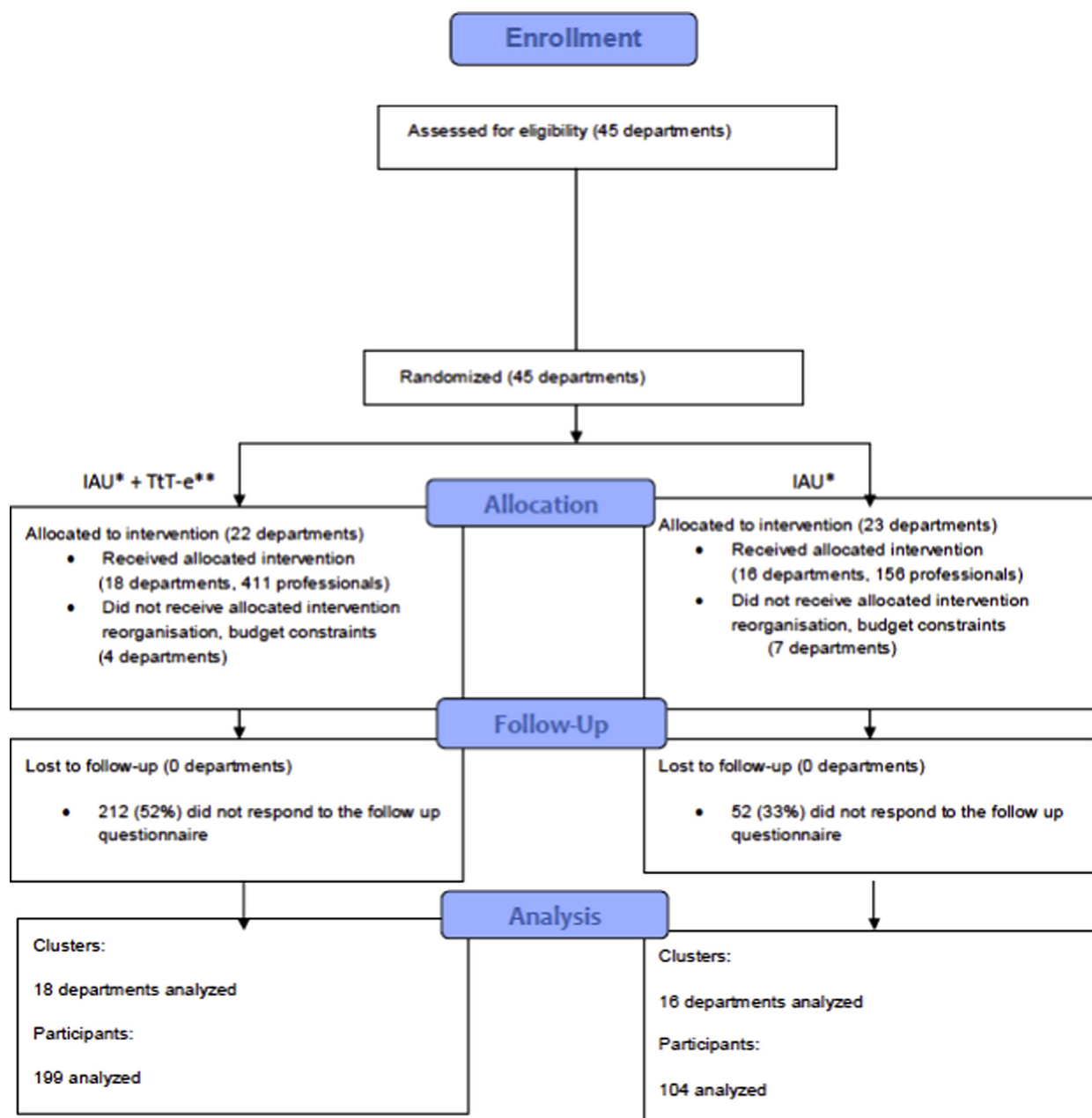
### 3. Results

Fig. 1 shows the flow of departments through the trial, showing that 34 departments completed the study. In the intervention

condition, 40 trainers from 18 departments were trained by masters. Of the total of 567 professionals that started T0, 303 (53%) completed the follow-up assessment. More professionals in the intervention group completed the assessment. The study group compared to the control group. Adherence to the training programme was rated high ( $n=3$ ) or very high ( $n=4$ ).

Table 1 shows that relatively more nurses were allocated to the intervention condition. Groups show comparable scores on all outcomes at T0.

Table 2 shows the results of the multilevel analyses. At T1, the intervention condition showed significantly higher scores on guideline adherence, self-evaluation of knowledge and provider confidence than the control condition. No difference was found on



\* IAU = implementation as usual

\*\* TtT-e = e-learning supported Train-the-Trainer program

Fig. 1. Flow of the study.



**Table 1**Sample features of completers at baseline in *n* (%) unless otherwise stated.

	Intervention group <i>n</i> = 199, 18 departments	Control group <i>n</i> = 104, 16 departments
Female gender	139 (70)	67 (64)
Age mean (SD) yrs	42 (12)	43 (12)
<b>Professional discipline</b>		
Nurse	121 (60)	51 (49)
Psychologists/psychiatrists	52 (28)	32 (31)
Other	26 (12)	21 (20)
<b>Skills of professionals</b>		
Practice experience mean (SD) (yrs)	18 (11)	17 (12)
Experience with suicidal behaviour mean (SD) yrs	14 (10)	13 (10)
Previously trained in discussing suicidal behaviour	42 (21)	28 (27)
Time between T0 and T1 (months) mean (95% CI)	3.7(3.4–4.1)	4.1 (3.8–4.4)
Guideline adherence mean (SD)		
Min 0 max 100	64.0 (9.5)	65.6 (9.7)
Self-evaluation of knowledge mean (SD) min 7 max 35	23.0 (3.8)	25.1 (4.5)
Provider confidence mean (SD)		
Min 2 max 10	6.8 (1.5)	7.2 (1.5)
Appropriate response mean (SD)	56.1 (12.1)	52.9 (9.7)

**Table 2**

Results of the multilevel analyses\* at T1 for all completers.

	Intervention <i>n</i> (199)	Control <i>n</i> (104)	<i>B</i> (95% CI)	<i>p</i> -value	Effect size**
Guideline adherence range 1–100	70.5 (12.5)	66.0 (11.2)	4.6 (1.6–7.5)	0.02	0.4
Self-evaluation of knowledge range 7–35***	26.6 (3.1)	24.1 (2.3)	2.7 (2.0–3.4)	< 0.001	1.0
Provider confidence range 2–10***	7.7 (1.1)	6.9 (1.4)	0.8 (0.4–1.2)	< 0.001	0.7
Appropriate response range 12–280	55 (17.7)	53 (9.1)	1.6 (–1.7–4.9)	n.s.	

\* Model with random intercept for department, controlling for baseline. Intraclass correlation coefficient=6%.

\*\* Cohen's *d*.\*\*\* Missing: *N* = 21, of which 12 in the intervention and 9 in the control group.**Table 3**

Separate results of the multilevel analyses\* at T1 for nurses and psychiatrists/psychologists.

	Nurses <i>N</i> = 172			Psychiatrists/psychologists <i>N</i> = 84		
	<i>B</i> (95% CI)	<i>p</i> -value	Effect size		<i>p</i> -value	Effect size
Guideline adherence	6.6 (3.2–10.0)	< 0.001	0.6	–1.2 (–6.1 to 3.7)	Ns	
Self-evaluation of knowledge***	2.7 (1.7–3.8)	< 0.001	0.9	1.9 (0.7–3.2)	0.005	0.8
Provider confidence***	0.7 (0.2–1.2)	0.009	0.5	1.0 (0.3–1.6)	0.007	0.7
Appropriate response	0.0 (–3.5 to 3.6)	ns		5.5 (–2.7 to –13.9)	Ns	

\*\*Cohen's *d*.

\* Model with random intercept for department, controlling for baseline. Intraclass correlation coefficient=6%.

\*\*\* Missing: *N* = 16, of which 15 in the nurses and 1 in psychiatrist/psychologist group.

the SIRI-2. Significant improvement of outcomes at T1 can be explained by changes between professionals (level 1;  $p < 0.001$ ) but not by changes between departments (level 2;  $p = 0.1$ ).

122 professionals (61%) in the intervention condition viewed the e-learning module for an average duration of 40 min ( $SD = 18$ ). The average score of appreciation of the module was 6.9 ( $SD = 1.4$ ) on a scale of 1–10. The e-learning had no significant effect on guideline adherence above and beyond the face-to-face training ( $b = 1.9$  (–0.8 to 4.5),  $p = 0.2$ ). In the intervention condition 85% ( $n = 98/115$ ) stated they had read the summary of the guideline at T1, compared to 20% ( $n = 31/149$ ) in the control condition ( $\chi^2(1) = 80.5$   $p < 0.001$ ). In the control condition, 67(46%) professionals were not aware that the guideline had been issued in the previous year.

Table 3 presents the effects of the intervention for nurses as compared to psychiatrists/psychologists. At T1, nurses but not psychiatrists/psychologists in the intervention group showed more guideline adherence than the controls. Both nurses and psychiatrist/psychologists showed more self-evaluation of

knowledge and provider confidence. The intervention was shown to have no effect on the SIRI-2.

#### 4. Discussion

This study examined the additional effects of an e-learning supported Train-the-Trainer programme (TtT-e) on adherence to the multidisciplinary practice guidelines on the assessment and treatment of suicidal behaviour (van Hemert et al., 2012). At the 3 months follow-up, mental health professionals who received TtT-e in addition to traditional guideline dissemination showed stronger guideline adherence, more self-perceived knowledge of suicidal behaviour and more provider confidence in dealing with suicidal behaviour than professionals who were only exposed to traditional guideline dissemination. However, subgroup analyses showed that improved guideline adherence was found among nurses but not among psychiatrists and psychologists.

The additional effect of our intervention over and above implementation as usual might be explained by various elements. Firstly, the training offered hands-on techniques that could be directly applied in clinical practice. For example, the CASE interview method offered all professionals a structured and successful method to systematically assess suicidal behaviour. During four role plays, professionals experienced what it was like to take a more systematic approach how it was to addressing suicidality of their own suicidal patients by interviewing a colleague that had to act like a suicidal patient from his/her own daily practice. Personal feedback was provided by the trainers on the interaction between the two professionals. We hypothesised that by training professionals in these concrete techniques on their own 'patients', and by letting them experience the impact of the techniques when they themselves played a patient, confidence and guideline adherence increased. Also, the statistical rarity of suicide, the difficulty of the topic and the lack of formal training during (post) graduate education makes structured training in suicide practice skills a welcome intervention. No matter how experienced a professional is, responding to suicidal patients is always difficult, and therefore our intervention was welcomed by all professionals, whether novices or highly experienced. Within our study, we trained expert professionals to train their own team. Being trained by a peer in one's own team makes it easier to relate to and implement the training content to and within actual daily clinical practice. Also, within the current time frame, with its focus on production, there is little time for reflection on work processes. Our intervention brought together existing teams of experienced and less experienced professionals of all disciplines to learn how to best respond to suicidal behaviour.

Importantly, in the control condition, we found that implementation as usual (conferences, websites, books) resulted in little uptake of the guideline. At the 3 months follow-up, we found that most participants in the control condition had not read the summary of the guidelines, and almost half of the professionals in the control condition did not even know that the guidelines had been released. In contrast, after the intervention, 85% of the professionals stated to have read the summary of the guidelines.

As practice guidelines reflect everyday practice, professionals already show certain levels of guideline adherence without being trained. Their score on guideline adherence at baseline was close to the score of masters and above the average student score. However, among nurses, we found a 10% improvement on guideline adherence, which is postulated to be the maximum increase that is achieved after training professionals in guideline adherence (Grol and Wensing, 2006), and resembles the 10% change of educative interventions found in other studies on guideline implementation in general medicine (Grol and Wensing, 2006) and psychiatry (Weinmann et al., 2007).

No effect was found on the SIRI-2 which is in line with previous findings (Appleby et al., 2000; Gask et al., 2006), indicating a ceiling effect for mental health professionals, who are assumed to already have basic skills and knowledge of dealing with suicidal behaviours at baseline.

Nurses were more likely to improve on guideline adherence than psychologists/psychiatrists. This might be explained by daily practice in which nurses likely ask for a consultation with a psychiatrist or a psychologist consultation in case of a patient's emerging suicide risks. Consequently, psychiatrists and psychologists are more often and more closely involved in systematic diagnosis of suicidal conditions than nurses. Additionally, contrary to nurses, psychiatrists and psychologists are obliged to follow post-doctoral education. Therefore, budgets for that purpose to a considerable extent exceed budgets for nurses and chances to improve professional skills and knowledge are lower among nurses than among psychiatrists and psychologists.

The e-learning component did not seem to offer additional advantages above and beyond the face-to-face training. However, offering the e-learning module as an option, and having several ICT problems may have limited the effectiveness of our model. Also, the design of our study does not allow us to draw any causal conclusions on the effectiveness of e-learning. As e-learning has the potential to make implementation programs more flexible and scalable, we recommend studying the effectiveness of e-learning compared to face-to-face in a randomized design.

## 5. Limitations and strengths

In the intervention condition, more professionals both started and dropped out of the study, as compared to the control condition. This might be due to differences in motivation in terms of starting the study in both conditions. In the intervention condition, if a professional wanted to attend the face-to-face training, they had to have finished the baseline assessment. In the control condition, there was no such incentive to complete the baseline assessment. Therefore, more professionals in the intervention condition completed baseline. As there was no real incentive to complete the follow-up assessment, we argue that participants in the intervention condition that finished the baseline assessment primarily to gain access the face-to-face training were less likely to finish the follow up assessment. We hypothesise that professionals in the control condition who completed T0 were more intrinsically motivated to participate in the study, and therefore more likely to complete T1 as well, resulting in a lower drop-out rate.

One extra barrier for participation in our study was that the ICT environment in MHI's was often technically unable to display the video clips of the survey. This may have caused a considerable drop-out and possibly introduced selection bias, as professionals who were strongly committed to the theme of the study might have been more likely to finish the study. The technical difficulties might also partly explain why 46% (66) professionals did not use the e-learning module. Still, the overall drop-out rate in our study was comparable (Oordt et al., 2009) or even better (Hanbury et al., 2012) when compared to other studies involving professionals.

A strength of this study is its randomized controlled design, which is rare in this field of research (Weinmann et al., 2007). A randomized controlled study of this size provides a large amount of evidence. Also, the departments included represent the psychiatric departments in the Netherlands well (de Beurs et al., 2013b). Therefore, the external validity of the findings is considerable. Another strength was the timing of the study; we offered our intervention right after the PGSB had been released and endorsed by the Dutch Health Inspectorate. Therefore, we argue that TtT-e was welcomed by both management and professionals as being a well-timed intervention.

## 6. Implications and further studies

Our results support the idea that an e-learning supported Train-the-Trainer programme is an effective strategy to implement clinical guidelines. We found that TtT-e resulted in an improvement of individual professionals, but not in an improvement of team performance. As the assessment and treatment of suicidal behaviour is a multidisciplinary team effort (van Hemert et al., 2012), there should be a greater focus on the improvement of complete teams. Offering role-plays and feedback that target multidisciplinary collaboration could result in more beneficial effects at team level. Our results suggest that the effect of TtT-e is sustained over at least three months, but we do not know the effect in the longer term. A systematic review (Cherry et al., 2012)

found that booster sessions may be necessary to prolong the effect of our educational intervention. Next, we need to know the effect on clinical (patient) outcomes of our intervention and compare the effects found with other studies (de Beurs et al., 2013a; Grol and Grimshaw, 2003; Hegerl et al., 2010, 2013; Knox et al., 2003; Rutz et al., 1989; Szanto et al., 2007). In the current study, the relative effectiveness of the different elements of TtT-e (the Train-the-Trainer element, the face-to-face training, the e-learning module, the multidisciplinary training) has not been examined separately. Future studies may unpick the effects of the different elements, so that more targeted programs can be developed (Cherry et al., 2012).

#### Role of funding source

Nothing declared.

#### Conflict of interest

The authors declare that they have no conflicts of interest.

#### Acknowledgements

This study is funded by The Netherlands Organisation for Health Research and Development (ZonMW 171103006).

#### References

- Appleby, L., Morriss, R., Gask, L., Roland, M., Lewis, B., Perry, A., Battersby, L., Colbert, N., Green, G., Amos, T., 2000. An educational intervention for front-line health professionals in the assessment and management of suicidal patients (The STORM Project). *Psychol. Med.* 30, 805–812.
- Association, A.P., 2003. Practice Guideline for the Assessment and Treatment of Patients with Suicidal Behaviours. American Psychiatric Association.
- Australian, R., 2004. Australian and New Zealand clinical practice guidelines for the management of adult deliberate self-harm. *Aust. N. Z. J. Psychiatry* 38, 868–884.
- Boel, M., Doeve, M., 2007. Verminderen van suicidaliteit: beleidsadvies: actualisering van het Advies inzake Suicide, Gezondheidsraad 1986. Trimbos-Instituut.
- Capp, K., Deane, F.P., Lambert, G., 2001. Suicide prevention in Aboriginal communities: Application of community gatekeeper training. *Aust. N. Z. J. Public Health* 25, 315–321.
- Chagnon, F., Houle, J., Marcoux, I., Renaud, J., 2007. Control-group study of an intervention training programme for youth suicide prevention. *Suicide Life-Threat. Behav.* 37, 135–144.
- Cherry, M.G., Brown, J.M., Bethell, G.S., Neal, T., Shaw, N.J., 2012. Features of educational interventions that lead to compliance with hand hygiene in healthcare professionals within a hospital care setting. A BEME Systematic Review: BEME Guide No. 22. *Medical Teacher*, vol. 34, pp. e406–e420.
- de Beurs, D.P., de Groot, M.H., Bosmans, J.E., de Keijser, J., Mokkenstorm, J., Verwey, B., van Duijn, E., de Winter, R.F., Kerkhof, A.J., 2013a. Reducing patients' suicide ideation through training mental health teams in the application of the Dutch multidisciplinary practice guideline on assessment and treatment of suicidal behaviour: study protocol of a randomized controlled trial. *Trials* 14, 372.
- de Beurs, D.P., de Groot, M.H., de Keijser, J., Verwey, B., Mokkenstorm, J., Twisk, J.W., van Duijn, E., van Hemert, A.M., Verlinde, L., Spijker, J., 2013b. Improving the application of a practice guideline for the assessment and treatment of suicidal behaviour by training the full staff of psychiatric departments via an e-learning supported Train-the-Trainer programme: study protocol for a randomized controlled BMC trials 14.
- Gask, L., Dixon, C., Morriss, R., Appleby, L., Green, G., 2006. Evaluating STORM skills training for managing people at risk of suicide. *J. Adv. Nurs.* 54, 739–750.
- Girlanda, F., Fiedler, I., Ay, E., Barbui, C., Koesters, M., 2013. Guideline implementation strategies for specialist mental healthcare. *Curr. Opin. Psychiatry* 26, 369–375.
- Goldney, D., 2008. Suicide Prevention: A Practical Approach. Oxford University Press, Oxford.
- Grol, R., Grimshaw, J., 1999. Evidence-based implementation of evidence-based medicine. *Jt. Comm. J. Qual. Improv.* 25, 503–513.
- Grol, R., Grimshaw, J., 2003. From best evidence to best practice: effective implementation of change in patients' care. *Lancet* 362, 1225–1230.
- Grol, R.P.T.M., Wensing, M.J.P., 2006. Implementatie: Effectieve Verbetering van de Patiëntenzorg. Elsevier Gezondheidszorg, Amsterdam.
- Group, N.Z.G., 2003. The Assessment and Management of People at Risk for suicide New Zealand Guideline Group, Wellington.
- Gullestrup, J., Lequertier, B., Martin, G., 2011. MATES in construction: impact of a multimodal, community-based programme for suicide prevention in the construction industry. *Int. J. Environ. Res. Public Health* 8, 4180–4196.
- Hanbury, A., Farley, K., Thompson, C., Wilson, P., Chambers, D., 2012. Challenges in identifying barriers to adoption in a theory-based implementation study: lessons for future implementation studies. *BMC Health Serv. Res.* 12, 422.
- Hawton, K., van Heeringen, K., 2009. Suicide. *Lancet* 373, 1372–1381.
- Health, N.C.C.f.M., 2004. Self-harm: the short-term physical and psychological management and secondary prevention of self-harm in primary and secondary care. National Institute for Health and Clinical Excellence website. Available at: (<http://www.nice.org.uk/nicemedia/pdf/CG016NICEguideline.pdf>) (updated July).
- Hegerl, U., Mergl, R., Havers, I., Schmidtke, A., Lehfeld, H., Niklewski, G., Althaus, D., 2010. Sustainable effects on suicidality were found for the Nuremberg alliance against depression. *Eur. Arch. Psychiatry Clin. Neurosci.* 260, 401–406.
- Hegerl, U., Rummel-Kluge, C., Värnik, A., Arensman, E., Koburger, N., 2013. Alliances against depression – a community based approach to target depression and to prevent suicidal behaviour. *Neurosci. Biobehav. Rev.*
- Huisman, A., Robben, P., Kerkhof, A., 2009. An examination of the Dutch Health Care Inspectorate's supervision system for suicides of mental health care users. *Psychiatr. Serv.* 60, 80–85.
- Hutschemaekers, G.J., 2003. Multidisciplinary guidelines in Dutch mental health care: plans, bottlenecks and possible solutions. *Int. J. Integr. Care* 3, e10.
- Isaac, M., Elias, B., Katz, L.Y., Belik, S.-L., Deane, F.P., Enns, M.W., Sareen, J., 2009. Gatekeeper Training as a Preventative Intervention for Suicide: A Systematic Review. *J. Off. J.*
- Joffe, P., 2008. An empirically supported programme to prevent suicide in a college student population. *Suicide Life-Threat. Behav.* 38, 87–103.
- King, K.A., Smith, J., 2000. Project SOAR: a training programme to increase school counselors' knowledge and confidence regarding suicide prevention and intervention. *J. Sch. Health* 70, 402–407.
- Knowles, M.M.S., 1970. The Modern Practice of Adult Education. Association Press, New York.
- Knox, K.L., Litts, D.A., Talcott, G.W., Feig, J.C., Caine, E.D., 2003. Risk of suicide and related adverse outcomes after exposure to a suicide prevention programme in the US Air Force: cohort study. *Br. Med. J.* 327, 1376.
- Leitner, M., Barr, W., Hobby, L., 2008. Effectiveness of interventions to prevent suicide and suicidal behaviour: a systematic review. Scottish Government.
- Matthieu, M.M., Cross, W., Batres, A.R., Flora, C.M., Knox, K.L., 2008. Evaluation of gatekeeper training for suicide prevention in veterans. *Arch. Suicide Res.* 12, 148–154.
- McLean, J., Maxwell, M., Platt, S., Harris, F., Jepson, R., 2008. Risk and protective factors for suicide and suicidal behaviour: a literature review. Health and Community Care, Scottish Government Social Research. Scottish Government.
- Means, B., Toyama, Y., Murphy, R.F., Baki, M., 2013. The effectiveness of online and blended learning: a meta-analysis of the empirical literature. *Teach. Coll. Rec.* 115, 1–47.
- Neimeyer, R.A., MacInnes, W.D., 1981. Assessing paraprofessional competence with the Suicide Intervention Response Inventory. *J. Couns. Psychol.* 28, 176.
- Oordt, M.S., Jobs, D.A., Fonseca, V.P., Schmidt, S.M., 2009. Training mental health professionals to assess and manage suicidal behaviour: Can provider confidence and practice behaviours be altered? *Suicide Life-Threat. Behav.* 39, 21–32.
- Palmieri, G., Forghieri, M., Ferrari, S., Pingani, L., Coppola, P., Colombini, N., Rigatelli, M., Neimeyer, R.A., 2008. Suicide intervention skills in health professionals: a multidisciplinary comparison. *Arch. Suicide Res.* 12, 232–237.
- Pearce, J., Mann, M.K., Jones, C., van Buschbach, S., Olff, M., Bisson, J.I., 2012. The most effective way of delivering a Train-the-Trainers programme: A systematic review. *J. Contin. Educ. Health Prof.* 32, 215–226.
- Rogers, E.M., 2010. Diffusion of Innovations. Simon and Schuster, New York.
- Rutz, W., Knorr, v.L., Wälinder, J., 1989. Frequency of suicide on Gotland after systematic postgraduate education of general practitioners. *Acta Psychiatr. Scand.* 80, 151–154.
- Scheerder, G., Van Audenhove, C., 2006. Validation of an instrument measuring suicide intervention skills. *Psychiatr. Danub.* 18, 94.
- Shafraan, R., Clark, D., Fairburn, C., Arntz, A., Barlow, D., Ehlers, A., Freeston, M., Garety, P., Hollon, S., Ost, L., 2009. Mind the gap: improving the dissemination of CBT. *Behav. Res. Ther.* 47, 902–909.
- Shea, S., 1998a. Psychiatric Interviewing, the Art of Understanding. Saunders Company, Philadelphia.
- Shea, S.C., 1998b. The chronological assessment of suicide events: a practical interview-strategy for the elicitation of suicidal ideation. *J. Clin. Psychiatry* 59, 58–72.
- Stuart, C., WAALEN PhD, J.K., Haelstrom, E., 2003. Many helping hearts: An evaluation of peer gatekeeper training in suicide risk assessment. *Death Stud.* 27, 321–333.
- Szanto, K., Kalmar, S., Hendin, H., Rihmer, Z., Mann, J.J., 2007. A suicide prevention programme in a region with a very high suicide rate. *Arch. Gen. Psychiatry* 64, 914.
- Tompkins, T.L., Witt, J., 2009. The short-term effectiveness of a suicide prevention gatekeeper training programme in a college setting with residence life advisers. *J. Prim. Prev.* 30, 131–149.
- Twisk, J.W., 2006. Applied Multilevel Analysis: A Practical Guide. Cambridge University Press.
- van Hemert, A.M., Kerkhof, A.F.J.M., de Keijser, J., verwey, B., 2012. Multidisciplinaire richtlijn voor diagnostiek en behandeling van suicidaal gedrag. Nederlandse Vereniging voor Psychiatrie/Nederlands Instituut voor Psychologen/Trimbos Instituut, Utrecht.
- Verwey, B., Waarde, J.v., Rooij, I.v., Gerritsen, G., Zitman, F.G., 2007. Guidelines in Dutch Mental Health Institutions for Dealing With Persons Attempting Suicide. Wasserman, D., Rihmer, Z., Rujescu, D., Sarchiapone, M., Sokolowski, M., Titelman, D., Zalsman, G., Zemishlany, Z., Carli, V., 2012. The European Psychiatric Association (EPA) guidance on suicide treatment and prevention. *Eur. Psychiatry* 27, pp. 129–142.
- Weinmann, S., Koesters, M., Becker, T., 2007. Effects of implementation of psychiatric guidelines on provider performance and patient outcome: systematic review. *Acta Psychiatr. Scand.* 115, 420–433.



- Williams, J., Barnhofer, T., Duggan, D., 2005. In: Hawton, K. (Ed.), *Psychology and suicidal behaviour: elaborating the entrapment model*. Oxford University Press, Oxford, pp. 71–78.
- Wobrock, T., Weinmann, S., Falkai, P., Gaebel, W., 2009. Quality assurance in psychiatry: quality indicators and guideline implementation. *Eur. Arch. Psychiatry Clin. Neurosci.* 259, 219–226.
- Wyman, P.A., Brown, C.H., Inman, J., Cross, W., Schmeelk-Cone, K., Guo, J., Pena, J.B., 2008. Randomized trial of a gatekeeper programme for suicide prevention: 1-year impact on secondary school staff. *J. Consult. Clin. Psychol.* 76, 104.